spring, and towards the south in autumn; (4) if the charts of nebulosity are compared with isobaric and wind charts it will be seen that the zones of clear sky correspond to the regions of high pressure which lie on each side of the equator, and which give rise on the one hand to the trade winds, and, on the other, to the westerly winds which prevail towards the temperate regions of the two hemispheres. The zones of greater cloudiness extend above the regions of low pressures, viz. near to the equator, on the one hand, and near to 60° of north and south latitude. The distribution of cloud, taken as a whole, appears therefore to be a direct result of the march of the winds, and is regulated by the distribution of the atmospheric pressures.

THE new Industrial Institute at Bromley, Kent, was opened on Saturday last by Sir Lyon Playfair. Hitherto, he said, the country had prided itself upon the practical knowledge of its artisans, but it had relied too entirely upon that knowledge, and the consequence had been that countries which nurtured the intellects of their people had stepped in, and with their superior mental education had shown the world that the competition of the day was not one of local advantages, such as the possession of raw material applicable to industries, but a competition of intellect. England was realizing her position now, and training her sons by technical schools to compete intellectually with the countries round her, from whom she had learnt her lesson.

Science lately invited certain eminent American authorities on education to discuss in its columns the question, "What industry, if any, can profitably be introduced into country schools?" Mr. Samuel G. Love writes enthusiastically on the effects which may be produced on children by industrial or manual training. It "opens a way," he thinks, "to interest them, to develop and employ their perceptive faculties, and to make the otherwise unattractive experiences of school life cheerful and pleasant." As for the particular kinds of industry that may be most advantageously introduced, he contents himself with the general statement that "there are many things that can be done with profit in any and all schools; and, as soon as the pupil enters upon school life, one of them should be taken up, and each carried forward one after the other, just as the subjects of study are taken up and completed." Mr. Francis A. Walker is more precise. He proposes that approved methods of the Kindergarten should be carried upwards through the primary grades; that at the age of twelve, or thereabouts, there should be semi-weekly exercises with tools, preferably wood-working tools, and in clay-modelling; and that at the age of about fourteen, exercises in metal-working should be begun. Mr. Charles H. Ham takes a wholly different view. He objects to the introduction of "industrial features" into courses of popular education in rural districts, partly because industrial training is very costly, but chiefly because children in the country learn so many things in their ordinary work and play that they do not seem to him to need any special industrial training at school.

THE additions to the Zoological Society's Gardens during the past week include two Green-winged Doves (*Chalcophaps indica*) from Penang, presented by Mr. S. A. Clarke; two Alpine Newts (*Molge alpestris*) from Algiers, presented by Mr. Alban Doran; twenty Ruffe or Pope (*Acerina cernua*) from British fresh waters, presented by Mr. T. E. Gunn; a Whinchat (*Pratincola rubetra*), British, two White-faced Tree-Ducks (*Dendrocygna viduata*) from Brazil, purchased; two White-necked Storks (*Dissura episcopus*) from West Africa, two Demoiselle Cranes (*Grus virgo*) from North Africa, received in exchange; a Gayal (*Bibos frontalis* ♂), a Persian Gazelle (*Gazella subgutterosa* ♂), born in the Gardens.

OUR ASTRONOMICAL COLUMN.

THE ORBIT OF THE MINOR PLANET EUCHARIS.—Dr. L. de Ball has published, in *Mémoires de l'Académie Royale de Belgique*, tome xlix., an investigation of the orbit of *Eucharis* (No. 181), deduced from all the available observations made during the years 1878 (the year of its discovery) to 1886 inclusive. The discussion of the orbit of this minor planet is of considerable interest, as in part of its path it approaches Jupiter, and its consequent perturbations will afford material for a determination of the mass of that planet. To attempt such a determination at present would be premature, but a necessary preliminary to it is the determination of a sufficiently accurate orbit for the perturbed planet, and this is furnished by Dr. de Ball in the paper before us. The perturbations due to Jupiter and Saturn, using Bessel's values of the masses, have been taken into account, and great pains have been taken to reduce the places of the comparison-stars used to a uniform system—that of Auwers's Fundamental Catalogue. The great mass of observations discussed in this paper are equatorial observations; a considerable number of meridian observations made with the Washington transit-circle in 1878 are, however, also discussed. These do not harmonize very well with the equatorial observations, and Dr. de Ball is led to the conclusion (for which he is unable to account) that the corrections to reduce the Washington meridian observations to the system of the Fundamental Catalogue deduced from fundamental stars are not applicable to the observations of *Eucharis*, and gives the latter consequently a very small combining weight. But this want of harmony it doubtless due to the circumstance that the observations of fundamental stars are made in a bright field, whilst those of the planet must have been made in a dark field with illuminated threads—a difference which is quite sufficient to account for such a systematic discordance as Dr. de Ball has found to exist.

ASTRONOMICAL PHENOMENA FOR THE WEEK 1887 MAY 8–14.

(FOR the reckoning of time the civil day, commencing at Greenwich mean midnight, counting the hours on to 24, is here employed.)

At Greenwich on May 8.

Sun rises, 4h. 22m.; souths, 11h. 56m. 20·1s.; sets, 19h. 31m.; decl. on meridian, 17° 5′ N.: Sidereal Time at Sunset, 10h. 36m.

Moon (at Last Quarter on May 14) rises, 7h. 24m.*; souths, 0h. 26m.; sets, 5h. 19m.; decl. on meridian, 13° 41′ S.

Planet.	Rises. h. m.	Souths. h. m.	Sets. h. m.	Decl. on meridian. ° ′
Mercury	3 56	10 43	17 30	8 29 N.
Venus	6 1	14 30	22 59	25 10 N.
Mars	4 16	11 44	19 12	16 2 N.
Jupiter	17 30	22 44	3 58*	9 42 S.
Saturn	8 5	16 13	0 21*	22 17 N.

* Indicates that the rising is that of the preceding evening and the setting that of the following morning.

Variable Stars.

Star.	R.A. h. m.	Decl. ° ′			h. m.	
U Cephei	0 52·3	81 16 N.	May	9,	3 19	*m*
			,,	14,	2 59	*m*
U Monocerotis	7 25·4	9 33 S.	,,	9,		*M*
W Virginis	13 20·2	2 48 S.	,,	12,	2 0	*m*
δ Libræ	14 54·9	8 4 S.	,,	14,	3 36	*m*
U Coronæ	15 13·6	32 4 N.	,,	14,	19 50	*m*
S Libræ	15 14·9	19 59 S.	,,	13,		*m*
U Ophiuchi	17 10·8	1 20 N.	,,	9,	3 22	*m*
		and at intervals of			20 8	
U Sagittarii	18 25·2	19 12 S.	May	8,	20 0	*m*
R Scuti	18 41·3	5 50 S.	,,	13,		*M*
η Aquilæ	19 46·7	0 43 N.	,,	8,	0 0	*M*
S Sagittæ	19 50·9	16 20 N.	,,	14,	1 0	*m*
U Cygni	20 16·1	47 32 N.	,,	13,		*m*
W Cygni	21 31·8	44 52 N.	,,	9,		*M*
S Cephei	21 36·6	78 7 N.	,,	13,		*m*
δ Cephei	22 25·0	57 50 N.	,,	10,	0 0	*m*

M signifies maximum; *m* minimum.

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Occultations of Stars by the Moon (visible at Greenwich).

May.	Star.	Mag.	Disap.	Reap.	Corresponding angles from vertex to right for inverted image.	
			h. m.	h. m.	°	°
8	γ Libræ	4½	1 4	near approach	168	—
13	π Capricorni	5	3 35	4 57	93	274

GEOGRAPHICAL NOTES.

In the new number (iv.) of *Petermann's Mitteilungen* we find an interesting note by General Tillo on what he calls the chief water-partings of the earth. He points out that it is usual to indicate for each region the great water-partings, and to come down from that to what are considered as smaller or subordinate water-partings. But it seems to him that, from a general consideration of the earth's surface, the idea of a great world-water-parting may be worked out. This he illustrates by a Polar projection map in which the Old and the New World continents are brought face to face. On this he lays down one continuous line, broken only by Bering's Straits, extending from the south point of America, north along the west side of South and North America, in an irregular diagonal across Asia to the Isthmus of Suez, and down Eastern Africa to the Cape. No doubt there is much to be said for this general conception, especially as General Tillo admits that there are special continental water-partings which do not quite conform to the line of the great parting, though, as a matter of fact, nearly all the great rivers of the world are divided by this parting into two directions. It brings out strikingly the fact that the greater portion of the land-mass of the Old World, and by far the larger portion of the New World are drained into the Polar Atlantic basin.

Among the other papers in the new number of *Petermann* is one on the caravan routes between Suakim and Kassala, by Josef Menges. Dr. Ed. Petri contributes a paper of great interest containing some fresh and curious data on the Yakuts, of whose persistence, activity, and culture, he, like others, has formed a high estimate. Dr. Posewitz contributes a first paper on the geological condition of the Island of Billiton, with special reference to mining.

M. Chaffaujon has completed his exploration of the Orinoco and returned to Ciudad Bolivar. He states, in a letter dated March 15 last, that he has discovered the sources of the Orinoco, and found that the River Cassiquiari is only a branch of that river, uniting its basin with that of the Amazon; which seems pretty much what we knew before. M. Chaffaujon has sent a complete report of his exploration to the French Minister of Public Instruction, as well as some ethnographical curiosities, and a fairly complete collection of the fishes of the Orinoco.

At a recent meeting of the Hungarian Geographical Society, Herr Moriz Von Déchy gave an account of his exploration of the Caucasus last year, in company with the geologist Dr. Schafurzik. The exploration has been rich in scientific results. Besides taking numerous observations on glaciers, measurements of heights, and many fine photographs, the explorers have brought back with them large collections, which have been deposited in the Museum of the Society, the University of Buda-Pesth, and the Hungarian Geological Institute. There are eighteen boxes of rocks and minerals. There is a small collection of beetles, and several highly interesting and valuable macrocephalic skulls. These, with the large collection of plants obtained in the Expedition of 1885, will be of the highest value to writers on the geology and natural history of this interesting region.

It is stated in Copenhagen that an Expedition will be despatched late this summer by Herr A. Gamil, the equipper of the *Dijmphna* Expedition of 1882, to the north-east coast of Greenland. It is hoped that the explorers may reach a higher latitude than that attained by Lieut. Holm in 1884, and discern the "Sound" described by the East Greenlanders as running from the east to the west coast, somewhere in latitude 78° N. The Expedition will, if it starts, be commanded by Lieut. Hovgaard, who in 1882 commanded the *Dijmphna*.

France has succeeded in moving the eastern boundary of her Congo territory from the somewhat uncertain River Licona to the magnificent Mobangi. According to the *Times* Paris Correspondent, the *Thalweg* of the Mobangi is to be the boundary between the French territories and the Congo Free State; but how far up the Mobangi the boundary goes we are not informed. As, by the Berlin Treaty, we understand France cannot go farther north than 4° N. lat., we do not see that she gains much by this new boundary, should the Mobangi turn out, as is probable, to be identical with the Wellé. Had the Paris Correspondent taken the trouble to look at a map, he would not have told us that by this new advance France becomes mistress of the greater part of the Congo basin; the statement is absurd.

We are glad to learn of the safety of Mr. Carey, to whose extensive journeys in Central Asia we referred in a previous number. He has wintered at Hami, and is by this time probably well on his way to India.

Those interested in Dr. Junker will find a very full statement of his work, with a map, in the new number of the Proc. R.G.S., by Mr. J. T. Wills. Dr. Junker's travels in the Soudan and Central Africa have lasted from the spring of 1876 to the end of 1886, with the exception of about a year and a half in 1878–80. In his first journey he found the sources of the Wellé-Makua near Lake Albert Nyanza. In 1880–83 he explored the basin of the Makua and Kuta (probably the Upper Mobangi).

The Government of Victoria are preparing to send out a well-equipped expedition to explore the Owen Stanley Range of New Guinea, from Port Moresby, and have, we learn from the Proc. R.G.S., offered the leadership to the man of all others best able to carry out so difficult an undertaking to a successful issue—the Rev. J. Chalmers.

A further step has been taken in promotion of an expedition towards the South Pole, by the colony of Victoria. Acting on an offer made by Sir Allen Young to lead such an expedition, it is stated that Sir Graham Berry has brought the question of a Government grant towards the cost of the enterprise before the Victorian Cabinet, and that the matter is being urged forward with a view to the expedition starting from Hobson's Bay in October or November next.

THE WORK OF THE IMPERIAL INSTITUTE.[1]

II.

While extolling the comprehensive and well-organised sytems of technical education existing in all parts of the Continent and the United States, let us not undervalue the great progress which has been made in recent years in Great Britain in the advancement and extension of technical instruction. The Royal Commission on the Depression of Trade and Industry state, as the result of evidence collected by them, that "It would be difficult to estimate the extent to which our industries have been aided in various ways by the advance of elementary, scientific, and technical education during the last twenty years."

The important influence exercised by the admirable work which the organisation of the Science and Art Department has accomplished, upon the intellectual and material progress of the nation, is now thoroughly recognised. Prof. Huxley, the Dean of the Normal School of Science, in his recent important letter "On the Organisation of Industrial Education," has reminded us that "the classes now established all over the country in connexion with that Department, not only provide elementary instruction accessible to all, but offer the means whereby the pick of the capable students may obtain in the schools at South Kensington as good a higher education in science and art as is to be had in the country," and "that it is from this source that the supply of science and art teachers is derived, who in turn raise the standard of elementary education" provided by the School Boards. The extension of facilities for the education of those engaged in art-industries is constantly aimed at, as was recently demonstrated by the creation of free studentships for artisans in the Art Schools at South Kensington.

The necessity which has gradually made itself felt in the manufacturing towns of the United Kingdom for encouraging the study of science in its application to industries, by those who intend to devote themselves to some branch of manufacture or trade, has led to the establishment in about twenty-five towns in England and Scotland, and in two or three in Ireland, of colleges of science corresponding more or less to the Continental

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[1] Lecture (abridged) delivered at the Royal Institution, on Friday, April 22, by Sir Frederick Abel, C.B., F.R.S.; H.R.H. the Prince of Wales, K.G., F.R.S., Vice-Patron, in the Chair. Continued from vol. xxxv. p. 621.

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